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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/520,988	**Applicant(s)** WEESE ET AL.	
	Examiner DAVID P. RASHID	**Art Unit** 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23 and 25-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23 and 25-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

[1] This Office Action is responsive to Amendment D received on June 20, 2008. Claims 1-23 and 25-34 remain pending; Claim 24 cancelled; Claim 34 new.

Claim Objections

[2] In response to the Amendments to the Claims received on June 20, 2008, the previous claim objections are withdrawn.

Claim Rejections - 35 U.S.C. § 112

[3] In response to Remarks received on June 20, 2008, previous § 112 rejections are withdrawn.

Response to Arguments

[4] Remarks filed June 20, 2008 with respect to claims 1-3, 19, 28, and 32 have been respectfully and fully considered, but not found persuasive.

Summary of Remarks regarding Motion Model vs. Registration

> Applicant argues that the Examiner does not appear to understand the difference between a motion model and registering images. A motion model describes object motion, such as breathing. *See*, for example, page 12, line 23 - page 14, line 5 of the present application.

(Applicant Resp. at 10, Jun. 20, 2008.)

Examiner's Response regarding Motion Model vs. Registration

However, even if the Examiner didn't "appear to understand the difference between a motion model and registering image" it would be irrelevant if a claim allows both a motion model or image registration reference to read on it. An Examiner would not be expected to know "the difference" between a wheel or a coin if the Examiner respectfully believed the claim I question was directed to a circle.

Summary of Remarks regarding Claim 1

> Contrary to the Examiner's assertion, **W^n is <u>not</u> a motion model**. A motion model as defined in claim 1 characterizes states of motion assumed by the object. W^n describes how much two images are out of alignment. In *Bani-Hashemi et al.,* patient movement is not disclosed. Rather, *Bani-Hashemi et al.* moves the imaging apparatus between taking the contrast image and the mask image. In order to subtract the mask and contrast images (and get meaningful results), *Bani-Hashemi et al.* needs to line-up the two images.
>
> The cited reference relates to acquiring two sets of images (a mask and contrast series) by rotational imaging of a stationary object. The mask images are subtracted from the contrast series to provide an angiogram (more specifically, depicting the blood vessels with the contrast agent). Examiner contends that *Bani-Hashemi et al.* discloses the claimed subject matter at column 10, lines. 41-61 *(See* Office Action dated March 26, 2008, page 17). Applicants' representative avers to the contrary.
>
> Although the cited reference appears to collect images as the c-arm moves about a patient, the cited reference does not determine a motion model from these images. At column 10, lines 41-61, the cited reference appears to disclose the use of scaling transformations to compensate for organs that move during the image gathering process. This is different than a motion model, because the scaling transformations appear to create a uniform stationary image, and are not representative of an object in motion.

(Resp. at 15.)

Examiner's Response

However, the Examiner believes the Applicant is trying to restrict claim 1 to solely be read in the context of Applicant's motion modeling type disclosure on the basis of citing a "motion model" in claim 1 (which may or may not be read within the limits of Applicant's motion modeling type disclosure). The "motion model" of claim 1 is read to "characterize[[s]] states of motion assumed by the object while moving through the states of motion."

M.P.E.P. § 2111 titled "Claim Interpretation; Broadest Reasonable Interpretation" cites, in relevant part:

> During patent examination, the pending claims must be "given their broadest reasonable interpretation consistent with the specification." >The Federal Circuit's *en banc* decision in <u>Phillips v. AWH Corp.</u>, 415 F.3d 1303, 75 USPQ2d 1321 (Fed. Cir. 2005) expressly recognized that the USPTO employs the "broadest reasonable interpretation" standard:
> The Patent and Trademark Office ("PTO") determines the scope of claims in patent applications not solely on the basis of the claim language, but upon giving claims their broadest reasonable construction "in light of the specification as it would be interpreted by one of ordinary skill in the

> art." In re Am. Acad. of Sci. Tech. Ctr., 367 F.3d 1359, 1364[, 70 USPQ2d 1827] (Fed. Cir. 2004)." Indeed, the rules of the PTO require that application claims must "conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description." 37 C.F.R. 1.75(d)(1).

M.P.E.P. § 2111.

Applicant's interpretation of "motion model" is unpersuasive in light of it's usage in claim 1 to only be directed to "characterize[ing] states of motion assumed by the object while moving through the states of motion." In this context, W^n may be read as a "motion model" because W^n is a mapping between the motion of a body part (the "object") in the contrast sequence image at time T (a "state of motion") and the motion of a body part in the mask sequence image at what is estimated (the "state of motion") when the machine is rotated again. W^n is a motion model because if the contrast and mask sequence did not undergo any sort of motion between each other in comparing, W^n would not be needed as there would not need to be an expression of such motion between the two sets. However, W^n is an expression of such difference between the contrast and mask sequence accountable by motion of the body (as it is not inherently the machine itself that is chaotically moving each time it runs other that automated movements that are perfect each time), but the body that is unstill and chaotic. It is for these reasons that the Examiner respectfully believes W^n is in fact a "motion model", as the basis of such an argument is over the fact it is the patient that is moving between the contrast and mask run that would require a motion model such as W^n between the two sets of images. The Examiner suggests further limiting what characteristics the "motion model" holds as argued by Applicant to further differentiate from the prior art of record.

Summary of Remarks

> Furthermore, Bani-Hashemi et al. fails to disclose or suggest forming an intermediate image of the object from the motion model and the second modality images, the intermediate image representing the object as if it had moved over the range of motion over which the object moved as the first modatity data was acquired, as independent claim 1 recites. Examiner contends that the cited reference discloses an intermediate image and second modality images the "Mask Sequence" at Fig. 3, and a motion model at Fig. 4 (item 5).
>
> Figure 4 appears to disclose a flow chart of a registration technique employed by the cited reference. Item 5 relates to the transformation of data for *registration,* and is not indicative of a motion model. Rather, the interpolation allows for a revised depiction of a stationary object by using multiple data points. This is evidenced by step 4, in which the process of collecting image data is repeated to compensate for any apparent artifacts.
>
> Furthermore, the Examiner contends that an intermediate image and second modality images are disclosed by the "Mask Sequence" at Fig. 3 *(See* Office Action dated March 26, 2008, page 17). However, the subject claim *recites forming an intermediate image of the object from the motion model and the second modatity images.* Based on Examiner's citation, the intermediate image would be formed from itself and Fig. 4, Item 5. It is not possible to form an image from itself and an interpolation.

(Resp. at 15-16.)

Examiner's Response

However, under the context of "motion model" as argued above, *Bani-Hashemi et al.* discloses forming an intermediate image ("MASK SEQUENCE" image "$\theta_I+\Delta\theta$" in fig. 3) of the object from the motion model ("W^n" in fig. 3; fig. 4, element 5) and the second modality images ("MASK SEQUENCE" images "θ_1" through "θ_T" in fig. 3), the intermediate image representing the object as if it had moved during the acquiring of the second modality image data over the range of motion over which the object moved as the first modality image data was acquired (fig. 4, item 6; "If the mask image was acquired at angular position θ and the corresponding contrast image was taken at position $\theta+\delta\theta$. To get a perfect subtraction, we would need the mask image at position $\theta+\delta\theta$.", at 4:30-33).

An interpolation between the mask sequence frames "θ_I" and "θ_T" using the motion model W^n is an representation of an intermediate image "$\theta_I+\Delta\theta$" of the object q^n that is assumed to be an exact correlation between "θ_I" of the mask sequence. The interpolation is an expression that body part q^n has moved between "θ_I" and "θ_T" over the range of motion over which the object B^n moved as the contrast sequence is moving when acquired. An intermediate image cannot be formed "from itself" (Resp. at 16), but formed between "θ_I" and "θ_T".

Summary of Remarks regarding Claims 2 and 19

Applicant argues that claims 2 and 19 recite similar features as in claim 1, and the prior art of record does not read on claims 2 and 19 for the same reasons given in claim 1. (Resp. at 16-17.)

Examiner's Response

However, for the Examiner's reasons given above, the prior art of record anticipates claims 2 and 19.

Claim Rejections - 35 U.S.C. § 102

[5] The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the

international application designated the United States and was published under Article 21(2) of such treaty in the English language.

[6] **Claims 1-5, 7,10-16, 19-20, 22-30,** and **32-33** are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,690,106 (issued Nov. 25, 1997, hereinafter "Bani-Hashemi et al.").

Regarding **claim 1**, *Bani-Hashemi et al.* discloses a method (fig. 3) comprising:

acquiring first modality image data ("CONTRAST SEQUENCE" in fig. 3) while an imaged object (fig. 1, item 40) moves over a range of motion ("function of x, y, and θ" at 4:39-41; 4:13-25) and reconstructing the first modality image data into a motion artifacted first modality image ("CONTRAST SEQUENCE" image "θ_I" in fig. 3);

acquiring second modality image data ("MASK SEQUENCE" in fig. 3) and reconstructing the second modality image data into second modality images ("MASK SEQUENCE" images "θ_1" through "θ_T" in fig. 3) which represent the object in respective states of motion with as few motion artifacts as possible;

from the second modality images ("MASK SEQUENCE" images "θ_1" through "θ_T" in fig. 3), determining a motion model ("W^n" in fig. 3; fig. 4, element 5) which characterizes states of motion assumed by the object while moving through the states of motion;

forming an intermediate image ("MASK SEQUENCE" image "$\theta_I+\Delta\theta$" in fig. 3) of the object from the motion model ("W^n" in fig. 3; fig. 4, element 5) and the second modality images ("MASK SEQUENCE" images "θ_1" through "θ_T" in fig. 3), the intermediate image representing the object as if it had moved during the acquiring of the second modality image data over the range of motion over which the object moved as the first modality image data was acquired (fig. 4, item 6; "If the mask image was acquired at angular position θ and the corresponding contrast

image was taken at position $\theta+\delta\theta$. To get a perfect subtraction, we would need the mask image at position $\theta+\delta\theta$.", at 4:30-33);

forming a combination image (5:15-20; "subtraction data" at 3:53-59) from the intermediate image ("MASK SEQUENCE" image "$\theta_I+\Delta\theta$" in fig. 3) and the first modality image ("CONTRAST SEQUENCE" in fig. 3).

Regarding **claim 2**, *Bani-Hashemi et al.* discloses a method (fig. 3) of enhancing a first image ("CONTRAST SEQUENCE" image "θ_I" in fig. 3) of a moving object (fig. 1, item 40), the first image containing motion artifacts, the method including:

acquiring further images ("CONTRAST SEQUENCE" images "θ_1" through "θ_T" in fig. 3) that represent the object in a respective state of motion with as few motion artifacts as possible;

from the further images, determining a motion model ("W^n" in fig. 3; fig. 4, element 5) that characterizes the states of motion assumed by the object;

focusing (the subtraction step between the geometrically corrected mask data and contrast data is "focusing" on the contrast data) the first image ("CONTRAST SEQUENCE" image "θ_I" in fig. 3) by means of the motion model ("W^n" in fig. 3; fig. 4, element 5).

Regarding **claim 3**, *Bani-Hashemi et al.* discloses a method (fig. 3) of enhancing information contents (5:15-20; "subtraction data" at 3:53-59 leads to enhancement) of a first image ("CONTRAST SEQUENCE" image "θ_I" in fig. 3) of a moving object (fig. 1, item 40), to be reconstructed from projections acquired as the object moves over a plurality of states of motion ("function of x, y, and θ" at 4:39-41; 4:13-25) and containing motion artifacts, which method includes:

acquiring two further images (“MASK SEQUENCE” images “θ_1” through “θ_T” in fig. 3) that represent the object in at least two of the states of motion with as few motion artifacts as possible;

from the further images (“MASK SEQUENCE” images “θ_1” through “θ_T” in fig. 3), determining a motion model (“W^n” in fig. 3; fig. 4, element 5) that characterizes the states of motion assumed by the object while the projections are acquired;

forming at least one intermediate image (“MASK SEQUENCE” image “$\theta_I+\Delta\theta$” in fig. 3) of the object (fig. 1, item 40) from the motion model (“W^n” in fig. 3; fig. 4, element 5) and the two further images (“MASK SEQUENCE” images “θ_1” through “θ_T” in fig. 3), the at least one intermediate image representing one ore more of the states of motion assumed by the object while the projections are acquired;

reconstructing (5:15-20; “subtraction data” at 3:53-59) the first image (“CONTRAST SEQUENCE” image “θ_I” in fig. 3) from the projections of the object and the at least one intermediate image (“MASK SEQUENCE” image “$\theta_I+\Delta\theta$” in fig. 3).

Regarding **claim 4**, *Bani-Hashemi et al.* discloses the method as claimed in claim 1, wherein determining the motion model (“W^n” in fig. 3; fig. 4, element 5) includes:

determining a respective motion vector field (8:33-34) for parts of the object (fig. 1, item 40).

Regarding **claim 5**, *Bani-Hashemi et al.* discloses wherein forming the intermediate image (“MASK SEQUENCE” image “$\theta_I+\Delta\theta$” in fig. 3) includes:

forming other images (“MASK SEQUENCE” image “$\theta_I+\Delta\theta$” in fig. 3 is repeated for every “CONTRAST SEQUENCE” image “θ_I”) of other states of motion of the object from the second modality image data (“MASK SEQUENCE” in fig. 3);

weighting (equal weight) and subsequently superimposing (5:15-20; “subtraction data” at 3:53-59) the other images (“MASK SEQUENCE” image “$\theta_I+\Delta\theta$” in fig. 3 is repeated for every “CONTRAST SEQUENCE” image “θ_I”) and the second modality images (“MASK SEQUENCE” in fig. 3) in conformity with a frequency (the frequency being a fixed “θ”; *see also* 10:41-61 in regard to “breathing” creating a frequency of the rib cage) at which each of the other states of motion were assumed by the object while moving over the range of motion (“function of x, y, and θ” at 4:39-41; 4:13-25) while the first modality image data (“CONTRAST SEQUENCE” in fig. 3) was acquired.

Regarding **claim 7**, *Bani-Hashemi et al.* discloses the method as claimed in claim 1, further including:

focusing the combination image (the subtraction step between the geometrically corrected mask data and contrast data is “focusing” on the contrast data).

Regarding **claim 10**, *Bani-Hashemi et al.* discloses an image processing system (fig. 1) which includes a data processing unit (fig. 1, item 14) for carrying out the method as claimed in claim 1 (refer to references/arguments as cited in claim 1).

Regarding **claim 11**, *Bani-Hashemi et al.* discloses a medical examination apparatus (fig. 1), the apparatus including:

a device for forming images or projections by means of a first imaging method (the method used to obtain the contrast stack in fig. 2);

a second device for forming images or projections by means of a second imaging method (the method used to obtain the mask stack in fig. 2);

an image processing system that includes a data processing unit (fig. 1, item 14) for carrying out the method as claimed in claim 1 (refer to references/arguments as cited in claim 1).

Regarding **claim 12**, *Bani-Hashemi et al.* discloses a computer readable medium containing instructions for controlling a data processing unit (fig. 1, item 14) in such a manner that the data processing unit can carry out (it is suggested that the data processing unit 14 "can" carry out the method as it is inherent that the processor must contain instruction for doing so) the method as claimed in claim 1 (refer to references/arguments as cited in claim 1).

Regarding **claim 13**, claim 4 recites identical features as in claim 13. Thus, references/arguments equivalent to those presented for claim 4 are equally applicable to claim 13.

Regarding **claim 14**, claim 4 recites identical features as in claim 14. Thus, references/arguments equivalent to those presented for claim 4 are equally applicable to claim 14.

Regarding **claim 15**, claim 5 recites identical features as in claim 15. Thus, references/arguments equivalent to those presented for claim 5 are equally applicable to claim 15.

Regarding **claim 16**, claim 5 recites identical features as in claim 16. Thus, references/arguments equivalent to those presented for claim 5 are equally applicable to claim 16.

Regarding **claim 19**, *Bani-Hashemi et al.* discloses a method of motion compensation comprising:

acquiring a first sequence of image data ("CONTRAST SEQUENCE" in fig. 3) of a moving object (fig.1, item 40) by a first imaging modality data acquisition system (fig. 1);

acquiring a second sequence of image data ("MASK SEQUENCE" in fig. 3) of the moving object by a second imaging modality data acquisition system (fig. 1 at a later time; 4:13-25);

determining a motion model ("W^n" in fig. 3; fig. 4, element 5) related to periodic motion (10:41-61 in regard to "breathing" creating a frequency of the rib cage, it being "related" to the calculated motion model that is based on the mask sequence) of the object based on the second sequence of image data;

using the determined motion model, generating from the first sequence of image data ("CONTRAST SEQUENCE" in fig. 3) a first modality image data set ("CONTRAST SEQUENCE" image "θ_I" in fig. 3) in a selected motion state.

Regarding **claim 20**, *Bani-Hashemi et al.* discloses the method as claimed in claim 19, further including:

generating a combined image data set (5:15-20; "subtraction data" at 3:53-59) in the selected motion state from the first modality image data set ("CONTRAST SEQUENCE" image "θ_I" in fig. 3) and a second modality image data set ("MASK SEQUENCE" image "$\theta_I+\Delta\theta$" in fig. 3) in the selected motion state.

Regarding **claim 22**, *Bani-Hashemi et al.* discloses the method as claimed in claim 19, wherein the second imaging modality data acquisition system includes a computer tomography

(CT) system, and ultrasound system, or a fast magnetic resonance (MR) tomography system (*refer to 112 rejection*; "magnetic resonance" in 11:14).

Regarding **claim 23**, *Bani-Hashemi et al.* discloses the method as claimed in claim 19, further including:

registering coordinates systems ("coordinates" at 6:19-25; "function of x, y, and θ" at 4:39-41; 4:13-25) of the first and second imaging modality data acquisition systems.

Regarding **claim 24**, *Bani-Hashemi et al.* discloses the method as claimed in claim 19, wherein the first and second imaging modality data acquisition systems (fig. 1) are mechanically linked (they are linked in that they are both the same data acquisition systems at different times (*i.e.* before and after contrast)).

Regarding **claim 25**, *Bani-Hashemi et al.* discloses the method as claimed in claim 19, further including:

sensing motion (the purpose of the invention itself is to find motion function "W^n" using "x, y, and θ" that involves the first and second sequence of imaging data (*i.e.* fig. 3)) of the object (fig. 1, item 40) at least during acquisition of the second sequence of imaging data.

Regarding **claim 26**, *Bani-Hashemi et al.* discloses the method as claimed in claim 25, wherein the sensed motion is a cyclic motion in which the object (fig. 1, item 40) cyclically assumed each of a plurality of motion states (10:41-61 in regard to "breathing" creating a frequency of the rib cage, it being "related" to the calculated motion model that is based on the mask sequence).

Regarding **claim 27**, *Bani-Hashemi et al.* discloses the method as claimed in claim 19, wherein the motion model ~~mode~~ ("W^n" in fig. 3; fig. 4, element 5) includes a motion vector field

(vectors includes in equations [1], [2], and [3] on col. 5) which indicates movement between at least two motion states.

Regarding **claim 28**, *Bani-Hashemi et al.* discloses an imaging system comprising:

a first imaging modality data acquisition system (fig. 1) for generating a first imaging modality sequence of image data ("CONTRAST SEQUENCE" fig. 3);

a second imaging modality data acquisition system (fig. 1) for generating a second imaging modality sequence of image data ("MASK SEQUENCE" fig. 3);

a motion sensor for sensing object motion (fig. 1, item 14; fig. 3);

a processor (fig. 1, item 14; fig. 3) for determining a motion model ("W^n" in fig. 3; fig. 4, element 5) from the sensed motion and the second modality sequence of image data.

Regarding **claim 29**, *Bani-Hashemi et al.* discloses the imaging system as claimed in claim 28, wherein the motion model ("W^n" in fig. 3; fig. 4, element 5) characterizes motion states (motion states "θ_I" in fig. 3 are assumed) assumed by the object while moving among a plurality of motion states.

Regarding **claim 30**, *Bani-Hashemi et al.* discloses the imaging system as claimed in claim 28, further including:

operating mathematically with the motion model to transform the first imaging modality image data to a selected motion state ("MASK SEQUENCE" image "$\theta_I+\Delta\theta$" in fig. 3 is repeated for every "CONTRAST SEQUENCE" image "θ_I").

Regarding **claim 32**, *Bani-Hashemi et al.* discloses a method for motion corrected imaging comprising:

generating image data using a first imaging modality ("MASK SEQUENCE" in fig. 3);

generating a plurality of images using a second imaging modality ("CONTRAST SEQUENCE" in fig. 3);

from the second imaging modality images and sensed motion of an imaged object, generating a motion model ("W^n" in fig. 3; fig. 4, element 5);

operating on the first modality image data ("MASK SEQUENCE" in fig. 3) with the motion model to create a first modality image ("MASK SEQUENCE" image "$\theta_I+\Delta\theta$" in fig. 3) in a selected motion state ("$\theta_I+\Delta\theta$" in fig. 3).

Regarding **claim 33**, *Bani-Hashemi et al.* discloses the method as claimed in claim 32, further including:

combining the first modality image ("MASK SEQUENCE" image "$\theta_I+\Delta\theta$" in fig. 3) in the selected motion state ("$\theta_I+\Delta\theta$" in fig. 3) with a second modality image ("CONTRAST SEQUENCE" image "θ_I" is associated with "MASK SEQUENCE" image "$\theta_I+\Delta\theta$") in the selected motion state ("$\theta_I+\Delta\theta$" in fig. 3).

Regarding **claim 34**, *Bani-Hashemi et al.* discloses wherein the sensed motion (the motion being imaged in the sequence and contrast images) is a periodic motion ('organs such as heart, rib cage during breathing, etc" at 10:41-61 are inherently periodically motions) in which the object periodically assumes each of a plurality of motion states (the patient assumes each of these periodic motions).

Claim Rejections - 35 U.S.C. § 103

[7] The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

> the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

[8] **Claims 6** and **8** are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bani-Hashemi et al.* in view of <u>Motion Estimation of Skeletonized Angiographic Images Using Elastic Registration</u>, IEEE Transactions on Medical Imaging, Vol. 13, No. 3, 11/1994, pp 450 – 460 (hereinafter "Tom et al.").

Regarding **claim 6**, while *Bani-Hashemi et al.* discloses the method as claimed in claim 1, *Bani-Hashemi et al.* does not teach further including: elastically registering the intermediate image and the first modality image are elastically registered, prior to the formation of the combination image.

Tom teaches elastically registering an image wherein images are elastically registered (abstract; introduction, p. 450), prior to the formation of the completed image.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the intermediate image and first modality image of *Bani-Hashemi et al.* to be elastically registered as taught by Tom AND for the combination image of *Bani-Hashemi et al.* to be the completed image as taught by Tom "in order to estimate the motion of the corresponding arteries", Tom, Abstract and that it "is very successful especially with low contrast and noisy angiographic images", Tom, Abstract.

Regarding **claim 8**, claims 1 and 6 recite identical features as in claim 8. Thus, references/arguments equivalent to those presented above for claims 1 and 6 are equally applicable to claim 8.

[9] **Claims 9, 17 – 18, 21** and **31** are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bani-Hashemi et al.* in view of U.S. Patent No. 5,546,472 (issued Aug. 13, 1996, hereinafter "Levin").

Regarding **claim 9**, while *Bani-Hashemi et al.* discloses the method as claimed in claim 1, wherein the first modality image is one of a CT image (4:66-5:4 suggests CT use) and the second modality images are one of CT images (4:66-5:4 suggests CT use) and MR images, *Bani-Hashemi et al.* does not teach wherein the first image is a PET image or a SPECT image.

Levin discloses a feature guided method for obtaining an image of an object (fig. 1a) that teaches wherein the imaging system may be a CT, PET, SPECT, or other imager (17:6-11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for the first modality image of *Bani-Hashemi et al.* to be selected from CT, PET, SPECT, or other imager as taught as by *Levin* AND for the second modality images of *Bani-Hashemi et al.* to also be selected from CT, PET, SPECT, or other imager as taught as by *Levin* "to provide a method and apparatus which employs feature recognition imaging which determines how to scan and reconstruct images of other similar subjects without incorrect guesswork or free parameters.", *Levin*, 2:66-3:3.

Regarding **claim 17**, claim 9 recites identical features as in claim 17. Thus, references/arguments equivalent to those presented above for claim 9 are equally applicable to claim 17.

Regarding **claim 18**, claim 9 recites identical features as in claim 18. Thus, references/arguments equivalent to those presented above for claim 9 are equally applicable to claim 18.

Regarding **claim 21**, claim 9 recites identical features as in claim 21. Thus, references/arguments equivalent to those presented above for claim 9 are equally applicable to claim 21.

Regarding **claim 31**, claim 9 recites identical features as in claim 31. Thus, references/arguments equivalent to those presented above for claim 9 are equally applicable to claim 31.

Conclusion

[10] **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. § 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 C.F.R. § 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

[11] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578. The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-74155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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